

## Mathematics Test 2 for ACT

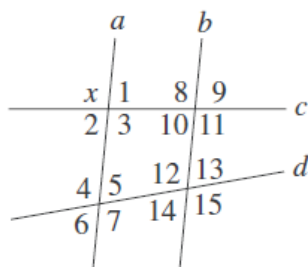
Plane Geometry (23%) (13 to 14 questions). Questions in this content area are based on the properties and relations of plane figures, including angles and relations among perpendicular and parallel lines; properties of circles, triangles, rectangles, parallelograms, and trapezoids; transformations; the concept of proof and proof techniques; volume; and applications of geometry to three dimensions.

### EXAMPLES

**Answers are at the end of this document!**

### **Angles and relations among perpendicular and parallel lines**

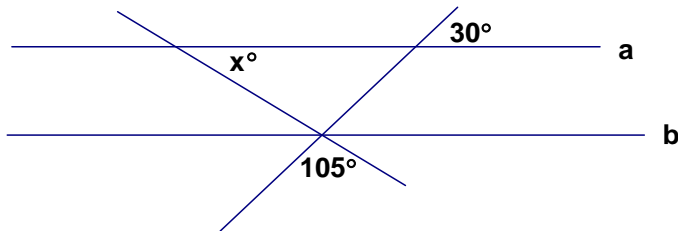
34. Lines  $a$ ,  $b$ ,  $c$ , and  $d$  are shown below and  $a \parallel b$ . Which of the following is the set of all angles that *must* be supplementary to  $\angle x$ ?



- F.  $\{1, 2\}$
- G.  $\{1, 2, 5, 6\}$
- H.  $\{1, 2, 9, 10\}$
- J.  $\{1, 2, 5, 6, 9, 10\}$
- K.  $\{1, 2, 5, 6, 9, 10, 13, 14\}$

### **YOU TRY Angles and relations among perpendicular and parallel lines:**

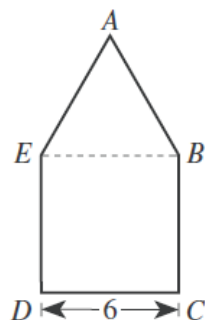
1. In the figure below, if line  $a$  is parallel to line  $b$ , then  $x = ?$



- F. 20
- G. 30
- H. 45
- J. 65
- K. 130

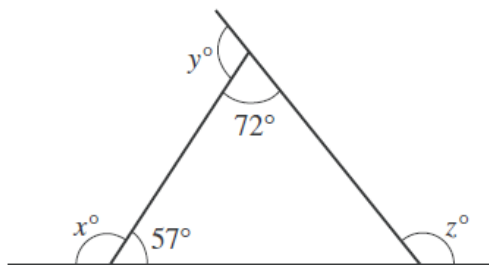
## Properties of triangles, rectangles, squares, and parallelograms

5. The figure below is composed of square  $BCDE$  and equilateral triangle  $\triangle ABE$ . The length of  $\overline{CD}$  is 6 inches. What is the perimeter of  $ABCDE$ , in inches?



- A. 18
- B. 24
- C. 30
- D. 42
- E. 45

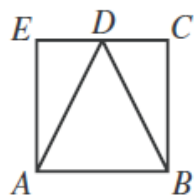
12. Given the triangle shown below with exterior angles that measure  $x^\circ$ ,  $y^\circ$ , and  $z^\circ$  as shown, what is the sum of  $x$ ,  $y$ , and  $z$ ?



- F. 180
- G. 231
- H. 309
- J. 360

K. Cannot be determined from the given information

16. In square  $ABCE$  shown below,  $D$  is the midpoint of  $\overline{CE}$ . Which of the following is the ratio of the area of  $\triangle ADE$  to the area of  $\triangle ADB$ ?

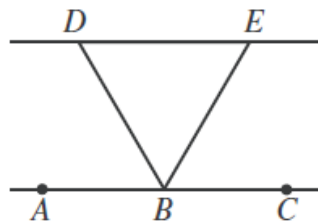


- F. 1:1
- G. 1:2
- H. 1:3
- J. 1:4
- K. 1:8

20. Sergio plans to paint the 4 walls of his room with 1 coat of paint. The walls are rectangular, and, according to his measurements, each wall is 10 feet by 15 feet. He will not need to paint the single 3-foot-by-5-foot rectangular window in his room and the  $3\frac{1}{2}$ -foot-by-7-foot rectangular door. Sergio knows that each gallon of paint covers between 300 and 350 square feet. If only 1-gallon cans of paint are available, which of the following is the minimum number of cans of paint Sergio needs to buy to paint his walls?

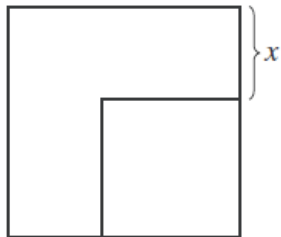
F. 1  
G. 2  
H. 3  
J. 4  
K. 5

39. In the figure below,  $B$  lies on  $\overline{AC}$ ,  $\overline{BD}$  bisects  $\angle ABE$ , and  $\overline{BE}$  bisects  $\angle CBD$ . What is the measure of  $\angle DBE$ ?



- A.  $90^\circ$   
B.  $60^\circ$   
C.  $45^\circ$   
D.  $30^\circ$   
E. Cannot be determined from the given information

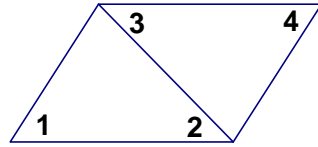
44. In the figure below, the area of the larger square is 50 square centimeters and the area of the smaller square is 18 square centimeters. What is  $x$ , in centimeters?



- F. 2  
G.  $2\sqrt{2}$   
H.  $4\sqrt{2}$   
J. 16  
K. 32

**YOU TRY Properties of triangles, rectangles, squares, and parallelograms:**

1. In the parallelogram below, a diagonal is shown and  $\angle 2$  measures  $54^\circ$ . What is the measure, in degrees, of  $\angle 3$ ?

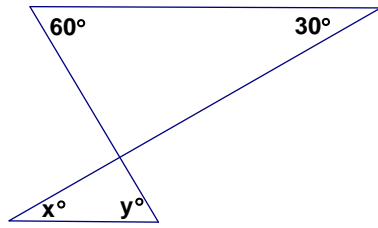


- A.  $36^\circ$   
B.  $42^\circ$   
C.  $54^\circ$   
D.  $63^\circ$   
E.  $72^\circ$
2. Three square tables with each side 3 feet long are placed together to form 1 long rectangular serving table for a banquet. Trim will be attached to the 4 edges of the serving table for decoration. How many feet of trim are needed for the perimeter of the serving table?
- A. 36  
B. 27  
C. 24  
D. 21  
E. 18
3. A certain rectangle has a perimeter of 21 inches and a width of 3 inches. A triangular section from 1 corner to the midpoint of a longer side is removed, as shown below. What is the area, in square inches, of the remaining piece?



- A. 5.625  
B. 11.25  
C. 16.875  
D. 22.5  
E. 47.25

4. In the figure below, what is the value of  $x + y$ ?



- F. 45
- G. 60
- H. 75
- J. 90
- K. 120

5. In the area of a square is 16 square inches, what is the perimeter, in inches?

- A. 2
- B. 4
- C. 8
- D. 16
- E. 32

6. What is the width of a rectangle with an area of  $48x^2$  and a length of  $24x$ ?

- A. 2
- B.  $2x$
- C.  $24x$
- D.  $2x^2$
- E.  $3x^2$

## Properties of circles

Use the table below for question 15.

A poll of 200 registered voters was taken before the election for mayor of Springdale. All 200 voters indicated which 1 of the 4 candidates they would vote for. The results of the poll are given in the table below.

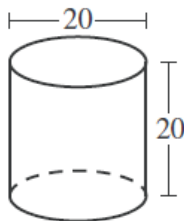
| Candidate  | Number of voters |
|------------|------------------|
| Blackcloud | 50               |
| Lue        | 80               |
| Gomez      | 40               |
| Whitney    | 30               |

15. If the information in the table were converted into a circle graph (pie chart), then the central angle of the sector for Gomez would measure how many degrees?

A.  $54^\circ$   
B.  $72^\circ$   
C.  $90^\circ$   
D.  $108^\circ$   
E.  $144^\circ$

31. A right circular cylinder is shown in the figure below, with dimensions given in centimeters. What is the total surface area of this cylinder, in square centimeters?

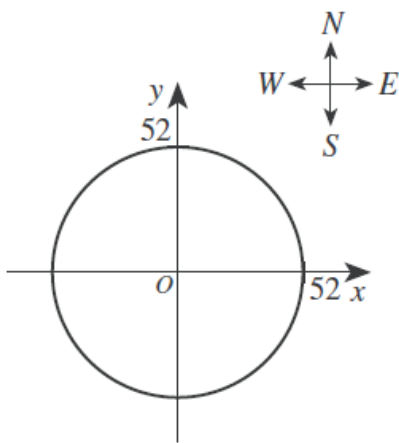
(Note: The total surface area of a cylinder is given by  $2\pi r^2 + 2\pi rh$  where  $r$  is the radius and  $h$  is the height.)



A.  $300\pi$   
B.  $400\pi$   
C.  $500\pi$   
D.  $600\pi$   
E.  $1,600\pi$

Use the information below for questions 54 and 56.

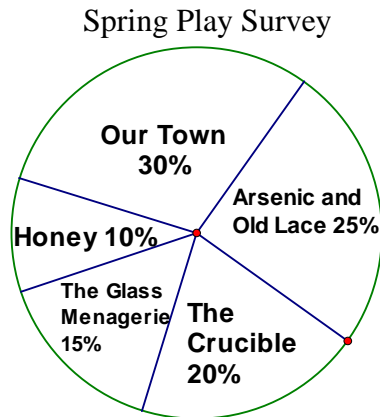
The radio signal from the transmitter site of radio station WGGW can be received only within a radius of 52 miles in all directions from the transmitter site. A map of the region of coverage of the radio signal is shown below in the standard  $(x,y)$  coordinate plane, with the transmitter site at the origin and 1 coordinate unit representing 1 mile.



54. Which of the following is closest to the area, in square miles, of the region of coverage of the radio signal?
- F. 2,120
  - G. 2,700
  - H. 4,250
  - J. 8,500
  - K. 16,990
56. The transmitter site of radio station WGGW and the transmitter site of another radio station, WGWB, are on the same highway 100 miles apart. The radio signal from the transmitter site of WGWB can be received only within a radius of 60 miles in all directions from the WGWB transmitter site. For how many miles along the highway can the radio signals of *both* stations be received?
- (Note: Assume the highway is straight.)
- F. 8
  - G. 12
  - H. 40
  - J. 44
  - K. 48

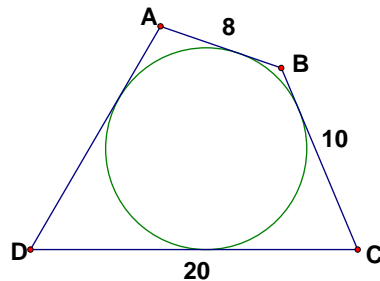
**YOU TRY Properties of circles:**

1. The drama instructor at Antilles Senior High School distributed a survey to the student body asking students to pick 1 from a list of 5 choices for the Spring Play. The circle graph below gives the results of the survey for the students who responded.



What is the measure, in degrees, of the central angle for The Glass Menagerie?

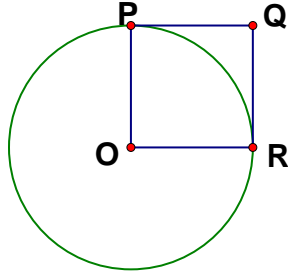
- F.  $15^\circ$   
G.  $27^\circ$   
H.  $54^\circ$   
J.  $72^\circ$   
K.  $85^\circ$
2. A circle is inscribed in polygon ABCD, as shown below. The given side lengths are in feet. What is the perimeter, in feet, of polygon ABCD?



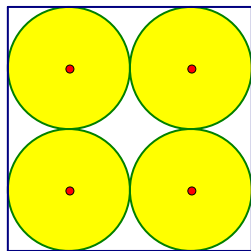
- F. 18  
G. 22  
H. 42  
J. 54  
K. 56
3. If the area of a square inscribed in a circle is 16 square centimeters, what is the area of the circle, in square centimeters?
- F.  $2\pi$   
G.  $4\pi$   
H.  $8\pi$   
J.  $16\pi$   
K.  $32\pi$



4. In the figure below, the area of the square OPQR is 2 square inches, what is the area of the circle with center O?



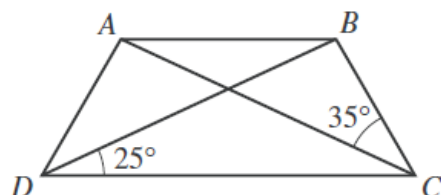
- A.  $\frac{\pi}{4}$   
 B.  $\pi\sqrt{2}$   
 C.  $2\pi$   
 D.  $2\sqrt{2}\pi$   
 E.  $4\pi$
5. In the figure below, PQRS is a square, and each of the 4 circles has a radius of  $r$ . What fractional part of the area of the square is **not** shaded?



- F.  $\frac{\pi - 4}{2}$   
 G.  $\frac{4 - \pi}{4}$   
 H.  $\frac{\pi}{4}$   
 J.  $\frac{4}{\pi}$   
 K.  $\pi$

### Properties of trapezoids

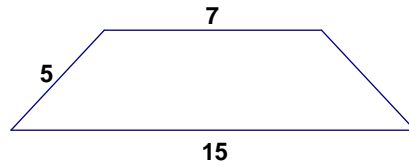
43. In isosceles trapezoid  $ABCD$ ,  $\overline{AB}$  is parallel to  $\overline{DC}$ ,  $\angle BDC$  measures  $25^\circ$ , and  $\angle BCA$  measures  $35^\circ$ . What is the measure of  $\angle DBC$ ?



- A.  $85^\circ$   
 B.  $95^\circ$   
 C.  $105^\circ$   
 D.  $115^\circ$   
 E.  $125^\circ$

**YOU TRY Properties of trapezoids:**

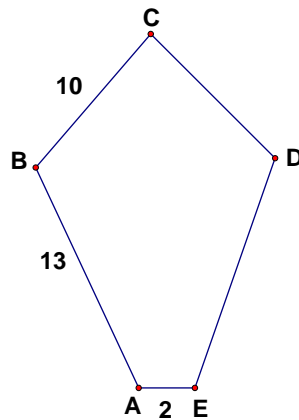
1. An isosceles trapezoid is shown in the figure below with the given dimensions in centimeters. The longer base of a similar isosceles trapezoid has a length of 225 cm. What is the perimeter, in centimeters, of the larger isosceles trapezoid?



- F. 495
- G. 480
- H. 405
- J. 330
- K. 180

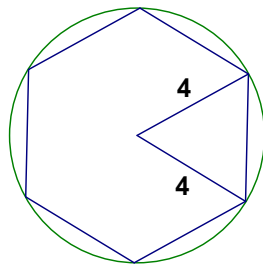
**Properties of Polygons**

1. In pentagon ABCDE shown below,  $\overline{AB}$  is 13 inches long,  $\overline{BC}$  is 10 inches long. And  $\overline{AE}$  is 2 inches long. The length of  $\overline{CD}$  is the same as the length of  $\overline{BC}$ , and the length of  $\overline{DE}$  is the same as the length of  $\overline{AB}$ . What is the perimeter, in inches, of ABCDE?



- F. 25
- G. 46
- H. 48
- J. 50
- K. 52

2. A regular hexagon is inscribed in a circle with a radius of 4 centimeters, as shown below. What is the perimeter, in centimeters, of the hexagon?

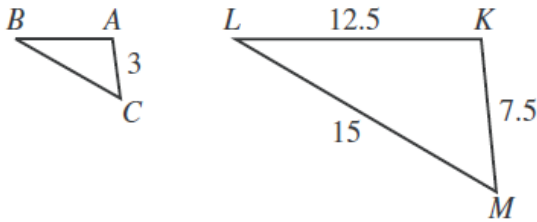


- A. 12
- B. 24
- C.  $24\sqrt{3}$
- D. 48
- E. 72

### Concept of proof and proof techniques

25. In the figure below, where  $\triangle ABC \sim \triangle KLM$ , lengths given are in centimeters. What is the perimeter, in centimeters, of  $\triangle ABC$  ?

(Note: The symbol  $\sim$  means “is similar to.”)



- A. 12
- B. 14
- C.  $21\frac{1}{2}$
- D. 35
- E.  $71\frac{3}{4}$

### Volume

29. Cube A has an edge length of 2 inches. Cube B has an edge length double that of Cube A. What is the volume, in cubic inches, of Cube B ?

- A. 4
- B. 8
- C. 16
- D. 32
- E. 64

### YOU TRY Volume:

1. Sam has a compost bin in the shape of a rectangular box with a length of 3 ft, a width of 4 ft, and a height of 2 ft. Tina has a compost bin in the shape of a rectangular box with a length of 4 ft, a width of 5 ft, and a height of 3 ft. The volume of Tina's bin is how many cubic feet more than the volume of Sam's bin?
  - A. 1
  - B. 3
  - C. 24
  - D. 36
  - E. 60
2. The interior dimensions of a rectangular box are 21 inches, 15 inches, and 12 inches, respectively. A maximum of how many cubes whose exterior edges are each 3 inches long can be placed inside the box?
  - A. 140
  - B. 315
  - C. 420
  - D. 1,260
  - E. 1,944

## Answers:

### Angles and relations among perpendicular and parallel lines

34. H

1. H

### Properties of triangles, rectangles, squares, and parallelograms

5. C

12. J

16. G

20. G

39. B

44. G

1. C

2. C

3. C

4. J

5. D

6. B

### Properties of circles

15. B

31. D

54. J

56. G

1. H

2. K

3. H

4. C

5. G

### Properties of trapezoids

43. B

1. G

### Properties of Polygons

1. H

2. B

### Concept of proof and proof techniques

25. B

29. E

1. D

2. A